Lesson 17 - Exercise And Its Beneficial Role In Nutrition And Digestion

- 1. The Philosophy Of Exercise
- 2. Effects Of Exercise On The Bodily Systems
- 3. The Three Major Categories Of Exercise
- 4. Exercise And Nutrition
- 5. Questions & Answers
- Article #1: Staying In Shape For Life By Richard K. Schmidt
- Article #2: Exercise: A Hygienic Perspective By Ralph C. Cinque, D.C.

1. The Philosophy Of Exercise

In order for health to be achieved and maintained, there must exist a proper balance between rest and activity. As certainly as rest follows exertion, so too must activity follow repose. It is on our own two legs that progress, growth, and true health are achieved. If we rest too much and do not balance our rest with the proper amount of physical activity, we can never achieve and maintain our true health potential.

Normal physiological functioning within the human body is dependent upon nutrition, drainage, warmth, and freedom from violence. In order to insure proper functioning for all the cells, body fluids should be in perpetual motion. Exercise is essential in maintaining this grand vital circulation and in giving tone to all vital functions and perfection to all vital changes. It also secures a proper supply of blood to every part of the body, keeps the lymph moving normally and maintains the general health of the entire system. Exercise serves to strengthen and nourish all the various organs and systems of the body. It is, in fact, the most important component of the Hygienic regime for developing vital tonicity for the entire body. When exercise is neglected, all the various muscles, organs and glands and the circulatory and respiratory systems become weakened and sluggish, leading to a decrease in physiological efficiency.

Exercise is much more than simply developing strong muscles. It is body building in the complete sense of the term. Every cell and fiber is involved. The heart, kidneys, liver, skin, hair, eyes, etc., including the brain and nervous system, are stimulated and strengthened in these various functions. The tone and quality of the entire system is improved. The skeletal system, for example, depends upon exercise in order to maintain its size, strength, and physiological functions.

When a part of the skeleton is placed in a cast due to a fracture, muscle tear, etc., in order to prevent further damage and allow time for healing, the bone and surrounding musculature begins to atrophy, reducing the size and strength. However, when the cast is removed and motion is once again possible for the area, the muscle and bones respond by regaining their normal structure and function The development of respiration; the powers of digestion and assimilation; and the strength of the heart and efficiency of elimination depend largely upon physical exercise. The blood and lymph improve, respiration is deepened, and the lung capacity is increased through exercise.

When a specific part of the body is put into action, the body responds by sending more blood, nutrients,

and nerve energy to that part. This response leads to overall improvement in the nutrition and drainage of the particular part involved. As the metabolism is increased, there is a consequent improvement in the tone and qualities of the tissues involved. Exercise is the most effective and efficient means for bringing about this result throughout the entire system.

The main concept for understanding the philosophy of exercise is: If we do not exercise, muscles begin to lose their tone, becoming weak and flaccid. In time, these muscles can atrophy to the point of wasting away. This same situation is true for the entire body. Not only do the structural parts of the body suffer from lack of exercise, but their function is impaired as well. By an irrevocable law of life—growth, development and strength of mind and body are acquired through exercise. Exercise is as essential to physical vigor, strength and development as air is to life. Exercise is cumulative in its benefits. If practiced correctly and consistently, strength and endurance along with coordination and agility become our reality. Posture is improved, which assures a correct relationship between the bonqs, muscles, organs and all other tissues of the body. A dimension of grace and poise along with an increase in beauty and symmetry is established and maintained. Most importantly, an overall feeling of joy and happiness from living life to the fullest is experienced. Exercise causes muscles that are tight and tense to be stretched, adhesion to be broken up, and nerve energy to be balanced and improved. It hastens the absorption and expulsion of various growths and deposits. Because of the intimate relationship between mind and body, the benefits derived from exercise on a physical plane also improve the qualify of the mind.

The effects of different exercises upon the body are extremely varied. Certain exercises develop great strength, others improve our endurance, agility, flexibility, speed, etc., but no one exercise can do it all. Therefore, it is very important that our exercise program be diverse enough to achieve all the benefits.

If deformity is to be corrected, one can learn specific exercises which will aid in correcting the problem. Some of the various deformities which benefit from corrective exercise are: round or stoop shoulders, spinal curvatures, innomonate abnormalties, bow legs, knock knees, club-foot, flat feet, various organ deficiencies, etc. These types of corrective exercises should only be performed under the watchful guidance of a skilled instructor.

Where a person is suffering from some chronic ailment or recuperating from acute symptoms, exercise can play an important and vital role in restoring the individual back to health.

At one point during the history of man, our ancestors were forced to produce great amounts of physical exertion in order to survive. But as civilization has grown and developed, and with technology creating more sedentary jobs, a large proportion of society now reaches maturity without experiencing a great deal of physical exercise. As a result, America has become a nation of fat and flabby weaklings, growing old prematurely and suffering a great deal from the ill effects produced from physical inactivity. Whereas more and more individuals are leading sedentary lives behind a desk, others are forced to overwork their bodies, thus creating injuries. Along with this imbalance, the ever-increasing specialization in work is leading to overuse of some parts of the body and neglect of other parts. As a result of this imbalance within our society, some substitute for the work of securing food, defending property, running from predators, etc., must be created. For it is nature's will that we have exercise. Nature will remove the muscles and render any limb entirely useless that has ceased to exercise. But if we begin to make efforts in restoring the integrity of the inactive body part, nature will once again restore what she originally took away.

Society today is geared towards the development of the intellect. The prevailing feeling today is to ignore physical culturing simply by covering it up with stylish clothing and gaudy cosmetics. However, we need only to open our eyes and compare the soft, flabby, unshapely bodies of the average adult with the fine symmetrical bodies of the well-developed man or woman to realize where true ugliness lies. There is no beauty or joy in beholding a skinny, malnourished physique or a fat barrel-shaped torso that is the rule and not the exception of present day society. We idolize the creative, witty, and intellectual giants of our society, ignoring the fact that they are often weak and sickly individuals. Although we should give credit to these intellectuals for their achievements, many of these people develop their mind

while ignoring their body. No one can give his best intellectual ability to the world if his body is not functioning properly. The thought of our world leaders sitting around a table, smoking, drinking, and eating constantly while deciding the fate of the world is extremely frightening. This human body of ours is responsible for carrying on the works of nutrition—digestion, assimilation, disassimilation and excretion of waste. If any of these functions are impaired, the brain, which is the organ of the mind, is also impaired.

The importance of keeping the body at a high degree of physical perfection while obeying all the laws, rules and requirements of nature is of greatest necessity. Our full potential can only be achieved when a powerful intellect is backed up by a powerful physical body — a body where the organ and tissues are strong and vigorous enough to sustain the mind, even during its most strenuous activity.

As has already been mentioned, there is a normal and inseparable relationship between the mind and the body. When there is an imbalance between these two, then the potential of both suffers. Nature has joined them together in a bond that is intimate and very delicate. The mind is dependent upon the body not only for its nourishment from the blood, but for the sensory stimulation it provides through the eyes, ears, nose, skin, and tongue. Nature has inseparably harnessed body and mind together so that they pull together in perfect concord. So long as they are allowed to do this, only good can come.

The importance of exercise can never be overemphasized. As practitioners of Natural Hygiene, you must always make your clients aware that complete health will never be maintained without regular exercise. Many schools of so-called natural healing spend a great deal of time on diet, vitamins, herbs, and techniques of body manipulation, but few ever deal with the value of exercise. Perhaps it is because the concepts and truths are too simple and not esoteric or sophisticated enough for these intellectually-oriented approaches. The philosophy of Natural Hygiene embraces the simple truths of life, and recognizes that life is motion and that we soon lose that which we don't use. As this lesson progresses, we will discuss in more detail many of the benefits derived from exercise. The fact that exercise decreases nervous tension, increases the clarity of the mind, leads to more efficient use of organs and systems, produces more power, endurance and flexibility, etc., makes it a very important component of the Hygienic system.

Exercise, as an integral part of Hygiene, must be considered in wholistic terms. Whatever forms of physical culturing we are involved in, it must influence the entire body in a balanced manner. The weight lifter who engages only in that activity but not in any other form of physical activities will have highly-developed muscles but a poorly developed cardiovascular system.

In order to insure a balanced program of physical conditioning, three types of exercise must be utilized. These are contraction, stretching, and aerobic exercises. Each type is unique and provides benefits not offered by the other two. In proper combination, these three types of exercise will provide the essentials for developing a strong, healthy body.

2. Effects Of Exercise On The Bodily Systems

2.1 Musculoskeletal System

Like most animals, man is endowed with the ability to move in relationship to whatever situation arises, as well as the ability to move different body parts in relation to each other. As a result, we are capable of

maintaining various postures and counterbalancing the effects of gravity. We are also capable of transferring mechanical energy to the outer world by doing work as well as by absorbing various mechanical effects. These skills are the result of the ability of the skeletal muscles to transform chemical energy into mechanical energy during their contractions.

The human body is composed of many different individual muscles, each with its own particular job to do. From a functional point of view, however, the mass of skeletal muscles in the organism may be looked upon as one large organ of movement, which constitutes about 40% of our total body weight. The reason for this consideration is that most activities, especially those connected with more vigorous activities such as athletics, are the result of the integrated activity of nearly all the muscles in the body. Thus, as Hygienic practitioners, you should develop exercise programs that will utilize all the various muscles. A program that includes stretching, contracting and aerobic exercise will fulfill this requirement.

Though the skeletal muscles function like one large organ, the instantaneous distribution of activity is continuously changing as the individual muscles are called into action or released into passivity, depending upon how our central nervous system responds to the particular activity.

Individual muscles, in most cases, act as a functional unit with other similar muscle groups. These groups are usually categorized as *flexors*, *extensors*, *supinators*, etc. In most situations, it is possible to determine one or a few prime movers. These prime movers are then assisted by *synergists* and are controlled or stopped by antagonists that are placed on the other side of the instantaneous axis of movement. So even though it is anatomically possible to define individual muscles, a functional or physiological subdivision of the individual musculature is not possible.

The skeletal muscle is made up of a series of different sense organs: mechanoreceptors, thermoreceptors, pain receptors, etc. Of these, only the mechanoreceptors have been thoroughly studied. The two major mechanoreceptors are the muscle spindles, situated in the center of the muscle, and the Golgis tendon organs located within the tendons.

All skeletal muscles in the body are made up of numerous muscle fibers. In most muscles these fibers extend the entire length of the muscle. Each muscle fiber is enervated by a mixed nerve (motor and sensory) located in the middle of the fiber. Each muscle fiber contains several hundred to several thousand myofibrils. Each myofibril in turn is made up of myosin and actinfilaments, which are specific protein molecules responsible for contraction. The myofibrils are suspended inside the muscle fiber in a matrix ailed sarcoplasm.

The muscle spindles are suspended in a network of connective tissue that is parallel with the muscle fibers. During exercise, the skeletal muscles are continuously undergoing lengthening and contraction. When a muscle fiber is lengthened, sensory impulses are generated and the muscle spindle becomes excited. On the other hand, when a muscle fiber is contracted, the effects of the muscle spindle become inhibited. This response of the muscle is known as the dynamic stretch reflex.

The dynamic stretch reflex is caused by the potent signals originated from key receptors located in the muscle spindle and transmitted by the primary nerve endings of these same spindles. When a muscle is suddenly stretched, a signal is transmitted through these primary endings to the spinal cord and will continue as long as the degree of stretch increases. The end result is a reflex contraction of the same muscle from which the muscle spindle signals originated. Thus a sudden stretch of a muscle causes reflex contractions of the same muscle returning the length of the muscle back toward its original length.

The muscle spindle is also responsible for the "negative stretch reflex." When a muscle is shortened (contracted), exactly the opposite effect of the dynamic stretch reflex occurs. Upon contraction, the muscle spindle becomes inhibited, thereby discouraging the further shortening of the muscle. Thus the negative stretch reflex opposes the shortening of the muscle in the same manner that the positive stretch reflex opposes lengthening of the muscle. Therefore, it is the muscle spindle reflex that maintains the relative length of a muscle.

The Golgi tendon is entirely an inhibitory reflex and functions exactly opposite from the dynamic stretch reflex. Located within the muscle tendons (that portion of muscle which attaches to the bone), the Golgi tendon is stimulated by relative muscle tension. This is different from the muscle spindle, which is responsible for detecting relative muscle length. The Golgi tendon detects tension transmitted into the spinal cord causing reflex effects on the specific muscle involved. When muscle tension becomes extreme, as in extreme physical exertion, the inhibitory effect from the Golgi tendon organ can be so great that it causes reaction and is a protective mechanism which prevents tearing of the muscle from its bony attachment.

The following points should not only help in summarising what has just been discussed, but should also provide a conceptual picture of the role of skeletal muscles in exercise.

1. Skeletal muscles allow the organism to adapt to whatever situation arises in the environment.
2. The muscular system helps to maintain proper physical posture as well as counterbalancing the negative effects of gravity.
3. The muscular system is composed of many different individual muscles. Depending upon what their duties are. They are either flexors, extensors, supinators, provators, etc. These muscles function in groups. Depending upon what activity is taking place, one or two muscles are the prime movers. Other muscles support the prime movers as synergists and yet other muscles provide antagonism that balances the prime movers. During most physical activities, the skeletal muscles of the entire body continually function as an integrated unit.
4. The skeletal muscles are intimately connected and are directly dependent upon the smooth functioning of the entire nervous system. In order to maintain the nervous system, attention must be given to all the areas of Hygienic living. Poor nutrition, lack of rest, etc. lead to an imbalance in proper regulation of nerve force, leading to a decrease in vital energy and less effective mechanical activity.
5. The sense organs of the musculoskeletal system provide the means by which the tone of the muscle is maintained. These organs provide the means to insure the maintenance of muscular stability by providing the necessary information for either contraction or relaxation of the specific muscle.

It is important to look at the muscular system in a wholistic manner. Though it is possible to develop individual muscle groups with specific exercises, this can only cause an imbalance with various other muscle groups that are not simultaneously developed. Therefore, it is important to provide a balanced and consistent exercise which will provide the necessary strength, flexibility and endurance to the entire muscular system. The end result will be a muscular system that is highly developed and functioning in harmony with all the other systems of the body.

The functions of the skeletal system are complex and varied. Besides providing a structural frame that muscles, nerves, organs and all other various tissue can surround and attach to, the skeletal system provides storage for many nutrients and produces blood cells. Bone tissue continually undergoes a process of bone destruction and repair. Large osteoclastic cells are continuously engaged in destruction of bone cells and osteoblasts continuously repair the damage.

According to Wolff's law, bone develops its greatest strength along the lines of greatest stress and strain. An increase in physical activity stimulates osteoblastic (building) activity, while a decrease favors an increase in osteoclastic (destructive) activity. In this manner the osteoclastic cells are encouraged to remove the useless bony structures and osteoblasts are stimulated to replace them with stronger bone in the region where greater strength is required. The more activity an individual individual engages in, the stronger and more durable the skeletal system becomes.

In our society, as an individual becomes older, his or her level of physical activity dramatically decreases. As a result, the bony structure begins to demineralize, leading to a weakening of the entire structure. As the individual becomes weak and feeble, the bons may begin to spontaneously fracture. Had the individual maintained his or her exercise program, he or she would not have become dependent

upon others to provide the movements no longer available to him.

2.2 The Respiratory System

2.2.1 Basic Mechanisms of lung expansion or contraction

The lungs can be expended and contracted by (1) downward and upward movement of the diaphragm to lengthen or shorten the chest cavity and by (2) elevation and depression of the ribs to increase and decrease the diameter of the chest. Inspiration takes place when the diaphragm contracts, pulling the lower boundary of the lung cavity downward, increasing its longitudinal length. Expiration takes place automatically when the diaphragm relaxes, allowing the elastic recoil of the lungs to draw it back upward. During normal inspiration, respiration takes place simply by contraction of the diaphragm. However, the mechanical means by which respiration takes place during exercise is a little more involved.

As we've already mentioned, normal inspiration takes place principally when the diaphragm contracts, thereby pulling and lengthening the lungs. This creates a lower pressure in the lungs that is automatically filled by the higher atmospheric pressure outside the body. Usually, expiration is an entirely passive process; that is, when the diaphragm relaxes, the elastic structures of the lungs, chest cage, and abdomen force the diaphragm upward.

During exercise, a greater demand is placed upon the mechanical structures of respiration. More muscles come into activity in order to increase the amount of oxygen now needed by the rest of the body. During inspiration, not only does the diaphragm contract, but muscles from the chest, neck and spine also contract and aid in the process. Expiration is no longer passive; it is aided by contractions from the abdominal muscles as well as from the lower rib muscles. From a mechanical point of view, if these various muscles are not strong and capable of functioning efficiently and effectively, the tissues of the body will not be supplied with sufficient amounts of oxygen during exercise.

2.2.2 Diffusing capacity of respiratory membrane

During respiration, oxygen is taken into the lungs from the atmosphere. In the lungs oxygen is exchanged with CO2 (waste product from cell metabolism) from the bloodstream. The oxygen is carried to all the tissues in the body in order to nourish and provide the necessary component for developing energy necessary for cell functioning. The overall ability of the lungs to exchange gases from the blood is expressed in terms of its diffusing capacity. In the average individual, the diffusing capacity for oxygen under resting conditions averages about 21 milliliters/minute. However, during strenuous exercise, the diffusing capacity for oxygen increases to about 65 ml/minute, or three times the diffusing capacity under resting conditions. In order for this to happen, three bodily functions must take place:

1. More blood vessels must become available, thus creating more surface area for the gaseous exchange between the lungs and the blood.
2. Dilation or expansion of all blood vessels.
3. Stretching of the lung surface responsible for gaseous exchange, thus making the walls thinner for gas exchanges and increasing the surface area.

The more an individual exercises, utilizing increased respiration, the more efficient the diffusing capacity will become. During rest or slight activity, only a small portion of the lung is used, resulting in a significant portion becoming dormant. The same holds true for the circulatory system where a significant number of blood vessels are not utilized. This disuse will lead to a decrease in the ability of the system to provide the necessary oxygen for the tissues even during the slightest degree of activity.

During strenuous exercise, the average individual may require as much as 20 times the normal amount of oxygen. Due to the increase in cardiac output, however, the time that blood remains in the area of gas

exchange is greatly reduced. As a result, the oxygenation of blood could suffer for two major reasons: the blood remains in contact with the lungs ,for shorter periods of time, and far greater quantities of oxygen are needed to oxygenate the blood. However, the blood is almost always fully oxygenated when it leaves the lungs even during the heaviest of exercise, due to two major factors:

1. As we've already mentioned, the diffusing capacity for oxygen increases about three fold during exercise.
2. The blood stays in the lungs about three times as long as necessary for oxygenation. Therefore, even with the shortened time of exposure during exercise, the blood can still become fully oxygenated.

As you can see, with exercise, the lungs and their structural synergists become stronger, more resilient and much more efficient. More tissues in the body are oxygenated while simultaneously more blood vessels and lung tissue are utilized. The lungs are interdependent upon all the other systems of the body. Only when all these systems are functioning smoothly and efficiently can we achieve the high levels of health and enjoyment that life has to offer.

2.3 Cardiovascular System

Perhaps the single most important factor that we must consider in relation to the cardiovascular system is "cardiac output." Cardiac output is the quantity of blood pumped from the heart into the aorta each minute. Venous return is the quantity of blood flowing from the veins back to the heart each minute. Although blood can temporarily increase or decrease in central circulation, the total cardiac output must be equal to venous return. The average cardiac output for normal young males is about 5.6 liters/minute. When including all adults and females, the cardiac output is an average of approximately 10% less than that of the normal male. Since cardiac output changes with body size, the output is commonly stated in terms of the cardiac index. The cardiac index is determined by cardiac output per square meter of body surface area. The average cardiac index for adults is about 3.0 liters per minute per square meter.

When a person rises form a reclining to a standing position with the muscles becoming taut, as if preparing for exercise, the cardiac output rises 1-2 liters per minute. Cardiac output usually remains almost proportional to the metabolic body rate; the greater the degree of activity or the muscles and organs, the greater will be the cardiac output. Therefore, the work output during exercise increases in linear proportion to the cardiac output. In bouts of very intense exercise, the cardiac output can rise as high as 30-35 liter per minute in a well-trained athlete.

This is 5-6 times the normal value.

During heavy exercise, tissues can require as much as 20 times the normal amount of oxygen and other nutrients hat are transported via blood. Thus, transporting enough oxygen from the lungs to these tissues may demand a minimal increase in cardiac output of five to six times its normal value! Since this is far greater than the normal, instimulated cardiac output of the heart, several factors which will insure this massive increase of cardiac output during this heavy exercise are called into play. They are as follows:

1. Before exercise begins, the autonomic nervous system is stimulated by the thought of exercise. This stimulation increases the permissive level of the heart pumping from 10-20 liters per minute, depending upon exertion caused by the exercise. Simultaneously, extra quantities of blood are pushed from the periphery toward the heart by constricting veins and increasing systemic filling pressure. These factors may increase cardiac output as much as 50% before exercise even begins!
2. At the onset of exercise, the blood vessels of the muscles become dilated, due to the signals transmitted from the motor cortex to the sympathetic nervous system. This instantaneously increases the cardiac output. The by-product of this sympathetic activity increases heart activity, mean systemic pressure, and arterial pressure.
3. The direct effect of increased metabolism in the muscles causes an increased use of oxygen and

other nutrients as well as the release of vasodilating substances. Thus, local vasodilation and local blood flow increase tremendously.

In summary, an intricate setting of background conditions of the cardiovascular system insures the required blood flow to the muscles during heavy exercise. These conditions include increased activity of the heart muscle. The local vasodilation in the muscles occurs as a direct consequence of muscular activity and finally sets the level to which the cardiac output rises. Thus, it is mainly the muscles themselves that determine the amount of increase in cardiac output, up to the limit of the heart's ability to respond.

The heart, like any other muscle, can be strengthened or weakened, depending upon the amount of activity or exercise it undergoes. According to Starling's Law, the heart is an automatic pump that is capable of pumping far more than the normal value of 5 liters per minute of blood which returns from peripheral circulation. Thus, the primary factor that determines how much blood will be pumped by the heart is the amount of blood that flows into the heart from systemic circulation, which is greatly enhanced by physical exercise. After a certain point, averaging about 15 liters per minute, cardiac stimulation (such as the stimulation of exercise) is necessary for this increase in the permissive level to which the heart can pump. Exercise greatly increases the effectiveness by which the heart provides blood and thereby oxygen and other vital nutrients to all areas and tissues of the body.

In juxtaposition with this increase in cardiac efficiency, these vital blood pathways are cleaned out and overall circulation is enhanced. Like any muscle, when there is an increase in activity and usage, there is an increase in size or musculature enlargement. Heavy athletic training causes the heart to enlarge, sometimes as much as 50%. Coincident with this enlargement is an increase in the permissive pumping level of the heart that may be as great as 20 liters per minute (as opposed to the maximal normal level of 13-15 liters per minute). So, when exercise is integrated into each day of our lives, there is an overall long-term increase of effectiveness of the entire cardiovascular system.

In summary, exercise greatly increases the demand of blood flow to the muscles and tissues. To insure this required increase of blood flow, there must be an increase in arterial pressure and an overall, increase in the activity of the heart muscle. As a direct consequence of muscular activity, there is local vasodilation of the muscle tissue involved that sets the final level of the rise in cardiac output. This rise is vital in the insurance of muscular efficiency. The heart acts like any other muscle in that it can be strengthened and enlarged with heavy exercise or weakened by neglect. As Hygienic practitioners, it is important to realize the relevance of exercise in providing blood, oxygen and other vital nutrients, to all areas of the body and enhancing overall cardiovascular efficiency in circulation. Only with maximal cardiovascular efficiency can we maintain our strength, endurance and clarity of mind.

2.4 Other Systems

Generally speaking, during heavy exercise there is a constriction of blood flow to certain organ systems that are not as immediately involved in the physiology of exercise as are the musculoskeletal, cardiovascular and respiratory systems. The organs of the gastrointestinal tract and the kidneys in particular are affected by the detour of blood flow and energy during exercise.

2.4.1 Kidneys

Severe exercise appears to have at least two principal effects upon the kidneys: diminished urine flow, and diminished renal (kidney) blood flow. When the blood volume becomes too great, the cardiac output and arterial pressure increase. This has a profound effect on the kidneys, causing loss of fluid from the body and blood volume to return to normal. Conversely, if blood volume falls below normal with a decrease in cardiac output and arterial pressure, the kidneys retain fluid and the progressive accumulation of fluid intake rebuilds up to the normal blood volume. During severe exercise, the rise in body temperature causes increased sweat and respiratory loss of water, which intensify kidney changes.

The sweat excreted during heavy exercise contains 300-600 mg. of urea per liter (a concentrated waste product that is diluted by the kidneys to prevent poisoning of the system), thus to a considerable extent compensating for the decrease of excretion of urea through the kidneys during exercise.

During heavy exercise, there is a great reduction in renal blood flow, and a slight alteration in the filtration rate of the kidneys. The reduction of renal blood flow is progressive for at least 30 minutes after the start of exercise and is directly related to the severity of the exercise. (Chapman, 1948 a.b.).

This drop in renal blood flow can be explained by the diversion of blood to the working muscles and the brain. Recovery of renal plasma flow is considerably slower than is the recovery of pulse rate or blood pressure (Chapman et al. 1948). The resting kidney has a large inbuilt safety margin so that the renal blood flow can be drastically altered without significantly altering the functioning of kidney filtering.

2.4.2 Gastrointestinal Tract

It appears that strenuous exercise inhibits both secretory and motor functions of the stomach. Studies done by Campbell, 1928 came to an early conclusion that exercise of moderate intensity (such as running 1-2 miles slowly) inhibited both secretion of gastric juice and the rate of gastric emptying of its contents. Lighter exercise (such as walking) did not change the rate of gastric excretion and actually appeared to enhance the rate of emptying into the stomach. The amount of exercise required to inhibit gastric function varied with the physical fitness of the individual. To generalize their findings, "exercise which produced no discomfort helped digestion, and exercise which produced discomfort delayed it." These observations were extended later in the century, concluding that all types of exercise after a meal prolonged the final emptying time of the stomach more than the same activity preceding the meal. When flouroscopically examined immediately after exertion, the stomach appeared either totally inactive or had only feeble peristaltic movements. Recovery, however, was prompt and emptying was greatly accelerated during the second hour after exercise.

In summary, there is evidence that heavy exercise has certain effects on kidney functioning. The sweat excreted during heavy exercise contains a high concentration of urea, thus compensating for the decrease of urea excretion via the kidneys during exercise. When there is an increase of sweat and respiratory loss of water, there is an intense change in the kidneys. Also, during extreme exercise, there is a drop in renal blood flow due to the diversion of blood to the brain and working muscles.

It also appears that strenuous exercise inhibits both secretory and motor functions of the stomach, although the amount of exercise required to inhibit gastric function is dependent upon the physical fitness of the individual. Though exercise tends to temporarily inactivate stomach function during exertion, there is a prompt recovery and acceleration of function in the post exercise hour.

3. The Three Major Categories Of Exercise

3.1 Contraction Exercises

Unlike the aerobic and stretching exercises, when we talk about contraction exercises we are considering primarily the development of muscular strength and endurance. Muscular strength refers to the amount of force that one can generate in an isolated movement of a single muscle or group of muscles. The greater the muscular strength of an individual, the greater the amount of force he or she will be able to

generate. Muscular endurance refers to the amount of time an individual can perform a particular contraction of force, i.e., how many sit ups, push ups, curls, etc. Muscular endurance involves a specific muscle or group of muscles, unlike cardiorespiratory endurance, which involves the total body.

Muscular strength and endurance can be developed by any one or combinations of three different modes of physical contraction exercises. These forms are termed isometric, isotonic and isokinetic contractions.

Isometric training involves muscle contractions against a resistance, greater than the force that can be applied where no movement of body parts takes place. Pushing against a sturdy wall or a parked car results in contractions of the muscles involved, but will not lead to any perceptible movement of the body or the objects involved. Numerous exercises can be devised simply by applying force by different parts of the body upon common objects around the house as a source of resistance.

Isotonic training involves the actual movement or lifting of a steady resistance through the range of motion of the various joints involved. A classic example of isotonic exercise is the lifting of weights.

Isokinetic training involves a constant speed of movement against a variable resistance. The strength of a muscle varies at different angles as a result of change in the angle of pull and perspective leverages.

Thus when we lift a constant resistance, the muscle is not exercised to the same extent at the middle of its motion as it was at the beginning. In other words, if we are curling a 50-pound weight, the closer we come to completing that curl, the stronger the muscle becomes. During isokinetic training, the resistance changes to match the strength of the muscle at each point in the range of motion.

Research has shown that each of the three forms of strength-training procedures produce substantial increases in strength, power and muscular endurance. In comparing the different forms as to which offers the most complete program, very little has been written on isokinetics. This is due to the fact that it is a relatively new science and is not totally understood., So, most of the comparison is between the isometric and isotonic procedures, and is as follows:

1. Both isometric and isotonic produce substantial gains in muscular strength, with many studies indicating that isotonic exercises provide the greater gain.
2. Both muscular endurance and recovery from muscular fatigue is faster in muscles that have been trained isotonically.
3. Isometric procedures develop strength only in limited portions of the total range of motion, whereas isotonic procedures produce a more uniform development in muscle strength.
4. Isometric procedures involve no joint movements and can be safely and effectively used during the period of recovery from injury in order to prevent substantial loss of muscle size and function.

   As mentioned earlier, research on isokinetic training is limited. However, a major advantage to this form of training over the other two forms is in the area of rehabilitation. Isokinetic exercise allows the muscle to exercise through a full range of motion with varying degrees of resistance. The resistance will depend on the strength of the the muscle at different angles in the range of motion. Although more research needs to be undertaken, isokinetic procedures appear to be just as effective as either isotonic or isometric—perhaps even moreso.

As Hygienic practitioners you should keep in mind that while contraction exercises are extremely beneficial in muscle strength and endurance, these procedures do very little for the development of the rest of the systems in the body. In fact, without balancing the contraction exercises with aerobics and stretching, these procedures could even be harmful. Keep in mind strong muscles and a weak heart do not make for a good combination. Develop exercise programs that utilize contraction training one day, aerobics and stretching the next. In this way you will be utilizing different areas daily while allowing other areas a chance to recover.

3.2 Stretching

Along with the other two categories of exercise, stretching is of crucial importance. Regardless of how superb and strong a physique may appear, without proper extension and stretching of the muscle groups, there will be an imbalance of posture. Additionally, there may be a muscle-bound disequilibrium which could deter the overall well-being and mental poise of the individual.

Stretching should be done in a slow, static manner. The body itself provides necessary weights and counterweights through a variety of balanced static postures. Stretching postures must maintain proper vertebral extension. If done correctly, stretching brings steadiness, health and lightness to the limbs. A thorough stretching program exercises every muscle, nerve and gland in the body. It secures a fine physique which is strong and elastic without being muscle-bound. In turn, stretching postures reduce mental and physical fatigue and soothe the nerves. Only when the body is fit and flexible can it serve as a vehicle of mental poise. Physical abuse and bodily disuse result in atrophy and dysfunction of the delicate mind-body interactions that lend us the ability to live and function in a constant state of total well-being.

3.3 Flexibility

Flexibility can be defined as the range of possible movement without a joint or a sequence of joints. A study (Kras, H.1972) done on several hundred adults who had complaints of chronic lower back problems revealed that approximately 80% had severe muscle weakness and joint inflexibility diagnosed as the cause, while only 20% had a specific anatomical disease or lesion as the cause. Thus, there is an obvious tendency in our society to neglect the body through lack of physical exertion including stretching and flexibility exercise.

Following is a summary of some recent research done on flexibility and exercise. (H.H. Clarke, 1975-76). There is little agreement among researchers with regard to the definition and limitations of "normal" flexibility. Flexibility is highly specific and varies for each joint or joint group. Thus, the flexibility of certain joints cannot be used to generalize the flexibility of other areas of the body. Although specific data is not available, there is a relationship between flexibility measures and differences in sex and age. Although flexibility can be increased with persistent exercise, the magnitude of increase is a very individual matter and is dependent upon the specific types and forms of activity. The connective tissues primarily responsible for resistance to movement include muscle, ligaments, joint capsules, and tendons. (These terms are sufficiently defined in the definition section.)

Research, logic and experience indicate that stretching exercises are effective in improving flexibility. Although many athletes and physicians still view such tragedies as muscle pulls, tears and strains as inevitable within a heavy exercise program, there is a growing awareness that these injuries are not accidental and can be predicted and thus prevented. Many of the top professional football teams (i.e., Steelers, Broncos, Redskins, etc.) now employ "flex" coaches to direct the players in stretching exercises. This is a prevention against injury.

An important factor to remember while incorporating a stretching routine into your daily exercise program is not to stretch or strain beyond a "pleasant tension." There will be/some discomfort initially, due to the trauma of the stretch to the unconditioned muscles, but the pain will most likely be in the form of a nagging ache or dull pull. "Pleasant tension" refers to a slight, dull discomfort of the muscle as a whole, with no accompanying sharp or burning sensations. When there is a sharp localized sensation in the ligament, back off; this is more than "pleasant tension." In other words, stretch just beyond what is comfortable. It is important not to hold tension while stretching; this defeats the purpose. Stretching, like all other forms of exercise, is a release. While holding a stretching posture, if you feel tension in a specific area, concentrate on relaxing that area, and releasing that tension. One should not hold the breath while stretching; instead, breathe normally. Oftentimes an exhalation is conducive to the release of tension. One other important point about tension: Don't hold tension in your face. There is a tendency

while releasing tension from the legs, back, arms, abdominal region, etc., to transfer the tension and sensation of discomfort to the face. Thus, often times one may find oneself with a furled brow, squinted eyes and clinched teeth. Let this tension go, along with the rest of it.

Stretching should be slow, consistent, sustained and static. Stretching should not be ballistic. Dr. Herbert deVries, Ph.D, lists some advantages of static stretching exercises:

There is less danger in going beyond the safe limits of stretching when doing static exercise because the exerciser moves into the position slowly and stops before harm is done. With ballistic exercises, the exerciser may realize too late that he or she has passed the limit. Also, the energy costs for slow, static stretching is lower than for rapid ballistic stretching, so the exercises aren't as tiring to the athlete.

> Furthermore, static stretching tends to relieve muscle soreness, while ballistic exercises may cause severe muscle soreness. Thus, it is recommended, when integrating stretching into your exercise program to increase your overall flexibility, be consistent and static in your movements. Listen to your body as you flow into the postures, never letting the tension accumulate, but rather relax into the stretch. Your body will let you know what your individual "pleasant tension limit" is, and don't take the stretch any further. You will not achieve the extreme position of the stretching posture overnight. It takes persistence, patience and cautions.

As Hygienists, we want to improve our level of vitality, strength, and endurance and then maintain it. If a person is overly tense or unable to sleep, their vitality and endurance will decrease. Conversely, when tension and stress cease, vitality increases. Stretching enhances the quality of life by giving us flexibility and endurance while enhancing our mental poise. We were born with a potentially wide range of motion; however, many people are caught in the laziness of today's society and do not use but rather abuse their potentials of strength, endurance, aerobics and range of motion. The high quality of life that is available to all of us thereby is reduced to laziness. Through exercise and the other requirements of Hygienic living we gain our health. Health is not a commodity which can be purchased with money. Instead it is an asset to be gained by hard work and proper living practices.

3.4 Aerobic Exercise

A wild cat, such as a tiger, lion, cougar or panther, stretches, runs, leaps, etc. every day. It is trim and vital and has an incredible endurance level. Place this animal in a zoo and, though its stretching continues, its physique "goes to pot" and the cat becomes lazy. Why? Its aerobic exercise has ceased.

An individual's capacity for sustaining heavy, prolonged muscular work is dependent upon the supply of necessary oxygen to the working muscles. The word 'aerobic' literally means "with oxygen." Therefore, "aerobic work" is defined as work performed when sufficient oxygen can be supplied by the body to reduce the necessary performance of the task. According to Cooper, 1970, the most beneficial aerobic exercises include jogging, running, swimming, cycling, brisk walking, handball and basketball. The aerobic demand for these various forms of exercise is highly dependent upon the amount and rate of the work performed.

Aerobic exercise is a mandatory component in the overall Hygienic program of exercise. Some of these aerobic activities are far less demanding than jogging or swimming or some of the other exercises mentioned above. Low-intensity aerobic exercises, such as walking, must be of longer duration, but they are highly effective and are certainly regarded as aerobic activity. Choosing an aerobic type of exercise is dependent upon individual considerations such as age and level of physical fitness. Nearly anyone, regardless of physical condition, can effectively contribute to his/her own method of aerobic fitness.

Aerobic training activates many wonderful changes in the body. Your lungs will process more air with less effort, your heart will grow stronger and pump more blood with each beat, the number and size of the blood vessels carrying blood and nutrients to the body tissues will be increased, tone of the blood

vessels and muscles will be improved and total blood volume will be increased.

The earliest to develop and most natural forms of exercise are walking and running. Primitive human beings survived by being able to walk or run great distances. We still have the bodily structure that was designed to cover 25 or more miles a day, but today our body rebels as soon as we attempt a 30-minute walk, let alone a 15-minute jog. We marvel at the stamina of the Tarahumara Indians of Mexico, who race at high altitudes in kickball games and relays that often last up to two days and cover one to two hundred miles. Perhaps our fascination with their stamina is a subconscious recognition of our natural potentials. According to Dr. Thaddeus Kostrubala, M.D., for 3 million years the genus of homo sapiens had to run to survive. He also says that our femur thigh bone is designed specifically for running.

In order to zero-in on specific characteristics of aerobic activity, some advantages of a well-planned jogging or running program are briefly mentioned below. Running should be done for 30-45 minutes four or five times weekly. Keep in mind that the length of the work out must be gradually worked into and thus will vary with the individual. The advantages of integrating a running program to your life are rich and many.

A running program is a simple, effective way to stimulate the circulation and exercise the heart. It provides a gentle, steady and prolonged demand on the heart, more so than does a series of short, choppy, ballistic exercises. Running exercises many parts of the body simultaneously. It can be adapted to the age and physical fitness of the individual and can be performed at nearly any time or place. Another advantage of running is that it requires no special facility or equipment, therefore the costs are minimal. Running is a good therapy to reduce anxiety and depression.

A runner's feet hit the ground 1600 to 1700 times during each mile. This can be rough treatment if done improperly. There are many criticisms of running as an exercise due to the high rate of injury. A recent *Runner's World* poll reveals that 22% of runners suffer from knee injuries, 20% from achilles tendon injuries, 10% from shin splints and 9% from forefoot strain and fracture. It is a current consensus among experts who practice sports medicine and run or jog themselves that most of the injuries are due to overwork, faulty shoes, weakness, lack of flexibility and improper running techniques. According to Dr. George A Sheehan, M.D., running causes a loss of flexibility in the back of the legs. Because of this lack of flexibility, exercises that stretch the muscles in the entire legs and back are a necessary component in the exercise program. It is possible to increase your chances of avoiding injury by not running on a hard cement surface, selecting high-quality running shoes, performing stretching exercises to counteract the lack of flexibility caused by the contractile reactions of running and by improving the overall muscle strength of the major muscle groups involved.

Regardless of what form of aerobic exercise that you chose to adhere to, take the necessary cautions to prevent injury, be persistent with it, and the benefits of aerobic fitness will enhance your total well-being.

Aerobics is not a total physical fitness program. It must be integrated into a consistent exercise program which also includes stretching and contractile, strength building exercise. Though these three categories of exercise often overlap, all three (aerobics, stretching, contractions) are necessary for maximum health and joyful living.

4. Exercise And Nutrition

Some of the first accounts of athletics and nutrition go back to the early Olympic Games in Greece. It was indicated (Harris, H.S., 1966) that there was a considerable insistence by Greek doctors on the importance of the diet that led to a keen interest in the diet of their athletes. Very little meat was originally consumed in Greece. The diet consisted of whole grains such as barley or wheat, eaten in cereal or bread form, and a variety of vegetables, such as onions, carrots, cucumbers, marrows, beans and various green leafy vegetables. Fruit was abundant, especially grapes and figs, apples, pears and nuts. The pomegranate was a prize. Although the Greeks did consume large amounts of goat milk products, adequate nutritional requirements were contained within the former food groups.

During the 1900's there developed the popular belief that any form of sustained muscular exercise required an abundance of meat foods. It was postulated that during exercise the substance of the muscle was consumed, and therefore hard work would remove a considerable portion of the muscle material that could only be replaced by eating animal protein. However, a study was done in Zurich (Eggleton, 1948). Two scientists climbed one of the Bernese Oberland peaks, one living on a nitrogenous-free diet (free of meats), while the other ate a diet containing nitrogenous foods. They found that when they were resting quietly, the amount of nitrogen excreted was not increased by their physical effort, either during or following the climb. This served as the basis for the modern outlook on the relationship of muscular performance to nutrients, which is that the muscle oxidizes the sugar and fat for the production of its energy, and does not use up its own substance. Thus, it is only when the muscles are chronically inactivated or during starvation that the muscle tissue is actually used up.

Energy requirements are obviously dependent upon the amount and quality of the expended energy during various tasks. This is also modified by other factors. For instance, energy requirements vary widely with age. A newborn baby requires less total energy than either a full-grown man or woman.

Individuals vary to a certain extent in their caloric requirement, and in certain diseased states this variance is even greater. In colder climates, there is a greater loss of heat to the surrounding air, and thus more caloric intake is required to balance this offset. In a warmer climate, less heat is radiated by the body and therefore less calories are needed.

As previously stated, there is a difference between the caloric requirements for carrying out various types of physical exertion. Some items of interest from the original data published by Mary Schwartz Rose in the United States are noted below. In a healthy human being, sleeping generally requires 65 cal./ hr.; standing relaxed requires 105 cal./hr.; light exercise, 170 cal./hr.; walking slowly, 200 cal./hr.; walking moderately fast, 300 cal./hr.; severe exercise, 450 cal./hr.; running slowly, 570 cal./hr.; an very severe exercise, 600-650 cal./hr.

Studies done just following W. W. II (Eggleton, 1948) indicated that a robust man doing heavy industrial work can metabolize 4000 calories of food during a working day. This raised the question of whether one variety of food is better than another in making up the calories consumed. Eggleton says that a good deal of evidence from the work on muscles and muscle extracts indicates that carbohydrates are the main fuel for exercise although some studies show that a proportion of the muscle fibers do utilize some fat for energy.

It is estimated that pure carbohydrate provides 1800 cal./lb. and so does pure protein; but pure fat provides 4200 cal./lb. The belief of these heavy laborers is that every time meat is consumed, a certain amount of fat is also consumed, and thus the total amount of food required to provide the same amount of calories is less when eating meats, than when eating just carbohydrates and proteins.

It is clear to see that our society is obsessed with caloric intake, with total disregard to the quality and composition of the foods which are consumed. There is much controversy about the composition of diet

for athletes. Much of the controversy concerns the amounts of protein, fat and carbohydrates consumed and their relationship to exercise and athletic performance. When discussing the quality of diet with regard to these three nutrient groups, we must examine two salient questions: (1) Whether an excess of one of these three nutrients is more important than any of the others, when pertaining to exercise, and (2) Whether the consumption of one or the other of them on the day of exercise or the athletic event is likely to be of much significance.

As far as the latter question is concerned, the only substance which is likely to have a significant effect when taken before an event is sugar. By sugar we mean the simple sugar from fruits are most readily used, and then the more complex sugars which are broken down from starches (carbohydrates).

A study was done on the relationship of breakfast to athletic performance (Holdi & Synn, 1946) concerning the carbohydrate intake of swimmers with relation to a 100-yard swim. The results showed that the compositon of the meal, as far as carbohydrates were concerned, did not effect either the blood sugar level at the end of the swim or the performance. They concluded that the energy reserves of the body were more important than the composition of the pre-swim meal. The implications are that a long-term maintenance of a quality diet has a much greater effect on performance than does the administration of a quality meal just prior to exercise.

Another study (Karpovich, 1941) showed that the amount of carbohydrate metabolized in exercise is dependent upon the amount of carbohydrate in the diet, and the lower the carbohydrate in the diet, the higher the amount of fat metabolized. Karpovich also claims that when energy is derived from fats, the work performed is actually 10% less economical than when the energy is derived from carbohydrates. There is also little doubt that protein or fat, since they need such a long digestion period, produce little benefit when administered just before an athletic event.

In regard to the former salient question of whether an excess of the three nutrient groups (carbohydrates, fats, proteins) is more important than any of the others when dealing with activity, we find that all three substances are equally important and are readily available in appropriate amounts in the Hygienic diet.

Though recent trends in nutritional advice tend to overemphasize protein, all protein in our bodies does not come from outside protein sources. There is a constant interchange of carbohydrates, fats and proteins within our bodies. Food is used not only for the formation of the body, but also for the energy expended in daily exercise and activity. Though carbohydrates and proteins are somewhat interchangeable, carbohydrates are more readily required in volume during physical, metabolic exercise than proteins.

For the utmost efficiency in exercising and for physical exertion, we need a good deal of both simple and complex carbohydrates in our daily diet. Through the gradual decomposition of monosaccharides (simple sugars) and polysaccharides (complex sugars or carbohydrates), our metabolism and activity level is sustained. Therefore, it seems that the ideal diet for an active person or an athlete is based on fresh fruits, vegetables (including leafy green vegetables and roots to maintain the necessary amount of protein and calcium), nuts and seeds.

As mentioned earlier, we find that in many societies there is too much emphasis on caloric intake, with little regard to quality and composition of diet. We must consider that some foods convert into calories at a higher rate than others. For instance, simple sugars contained in fruits convert to calories more readily and thus caloric discharge ceases much sooner, than do more complex sugars contained in many vegetables and legumes, which are more slowly converted and burned into calories. Meat and dairy products are even more slowly broken down and converted, and cause a lot of wear and tear on the digestive organs. In this respect, a diet centered around fresh fruits, vegetables and a small amount of nuts and seeds is far superior to a diet centered around meat and dairy products.

5. Questions & Answers

Why is it necessary for me to integrate all 3 of the major categories of exercise into my exercise program?

> Certain exercises, such as weight lifting only done on the upper body, or running, develop a few individual muscle groups. The causes an imbalance with the other muscle groups that are not simultaneously developed. For example, weight lifters often become muscle-bound because of their excessive contraction exercises (building strength and endurance) that leave no room for flexion and extension of those tightened muscles. One of my patients actually had broken blood vessels (bruises) on the surface of the skin from being so muscle-bound that it infringed on the circulation. We have found that integrating the proper combination of contraction, stretching and aerobic exercise into daily life and being consistent with it will provide the necessary strength, flexibility and endurance in the muscular system, maintaining an optimal level of functioning so that it may harmonize with the other systems of the body.

Why are people so obsessed with caloric intake, rather than the quality of the food they eat?

> In today's society there are many fads and fad diets that insinuate that the only relevant factor in weight loss is caloric consumption. With this assumption, many people feed their dieting bodies a set number of calories, but calories consisting of highly refined foods and often non-nutritional substances. Their bodies are forced to feed off of this refined food, but the energy derived from a low nutrition diet is less efficient. It seems logical that the quality of food is directly related to the quality of activity. Note that these effects are long term (over a long period of time) and that one wholesome pre-exercise meal is likely to have little immediate effect on the quality of exercise. It seems, however, that people are realizing more and more the superficiality of caloric consumption exclusively and the great importance of the quality and composition of food consumed.

Article #1: Staying In Shape For Life By Richard K. Schmidt

I once knew a man who exercised every day. His routines were sometimes as long as three hours, yet he never missed a day. I asked him one time what he was training for, why he stayed in such good shape. He merely replied: "I'm staying in shape for life." I then asked him how he was able to do it, how he managed to face such a gruelling workout day after day without a miss. He said simply: "I enjoy doing it. I look forward to my workout everyday."

This sounded logical, but I still went away with the impression that he had some unusual powers of self-discipline and self-motivation. Not many people in the world could do what he did. He just didn't seem to have the same motivation problem that most of us have.

Motivation is indeed a serious problem for all but a select few. But how do we overcome this motivation problem? How do we become more consistent with our daily exercise programs? Is there an ideal

exercise program that will help us do this? This paper is designed to help answer these questions.

For the past four years, I conducted a study on Exercise. I wanted to find out why it is so hard for people to motivate themselves to exercise. I talked to many people—some who were jocks and some who weren't. All, I found, agreed on the same thing: Exercise is important but hard to do. Rarely did I find anyone who was satisfied with his degree of consistency. I heard many excuses and alibis. They ranged from overcrowded schedules and personal problems to physical ailments, mental stress and plain laziness. However, in reality, all these were nothing more than the motivation problem in disguise.

Being a former professional athlete myself, I know how it feels to be in good physical shape. I want to stay in good shape all the time. But now that the ole coach isn't around to drive me, it's hard to psych myself up for the workouts. If I don't have anyone to work out with, it becomes twice as hard. The daily routine becomes as appealing as facing the Sahara Desert. Many others feel the same way.

Based on the information I gathered, I concluded that the motivation problem is linked directly to the exercise program itself. The more the person enjoys the exercise, the sport or the workout, the easier it is for him to get involved and challenge is the main attraction. The desire for exercise because we need it is, at best, secondary.

Obviously, the root of the motivation problem is in the head. Exercise Reform is a head trip—mind over matter. We are basically lazy creatures, prone to do only what is convenient and enjoyable. We just naturally need fun reasons to do things. The key, then, to Exercise Reform, is to find some way to make the workout as convenient and enjoyable as possible. An exercise program has to be designed to accomplish this. It has to be tailored to the average person with a busy schedule, to the person who doesn't play sports, who is faced with the task of working out on his own, often without the support of a workout partner, felt, if I could devise such an ideal program for myself, to overcome my own motivation problem, perhaps it would work for others as well.

It took the better part of a year to design such a program. I tried many different time schedules, different exercises and routines. Finally, I arrived at a comfortable program and spent the next three years experiencing it and studying the results. I am now convinced that it's the ideal program I was looking for. It has solved my own personal motivation problem—I consider it a complete success. The results of the past year, especially, leaves no doubt that almost anyone can achieve the same success.

Anyone can win out in his motivation struggle with his own personalized exercise program. However, in designing such a program, the person must focus on three main areas: He must: 1) choose a suitable time of day to work out; 2) choose the proper exercises for his program; and 3) focus on building the program into his bodily system. These are the three keys to consistency in the Exercise Reform.

Choosing The Proper Time For Exercise

As we consider the first of these keys, we are trying to choose the best time of day to work out. In doing so, we must focus on the most important thing: We must choose a time of day when we cannot be disturbed or interrupted by anyone or anything. This must be our time, a sacred, inviolable time that we devote entirely to ourselves.

However, finding a suitable time slot in a busy schedule is not easy. It seems we must give up something. Giving up an hour's sleep in the morning is the most logical thing to give up. For the lark, the day person like myself, giving up an hour's sleep in the a.m. is not hard. Most day people enjoy getting up early. But for the owl, the night person, it may pose a serious problem. But once over this obstacle, the owl, like the lark, will find many advantages and rewards connected with the early a.m. workout. Early a.m. is the most ideal time of day to work out for the following four reasons:

First, we must get up in the morning anyway, usually for reasons other than our own. But getting up an hour early is getting up because we want to, for our own reason—to work out and maintain our good health. This also eliminates the chance of oversleeping, causing us to be late for work and other

commitments.

Second, getting up an hour early clears the workout away before the regular daily activities begin. This eliminates unforeseen complications such as changes in schedule, minor illnesses, extra tiring days, etc. from causing cancellation of late scheduled workouts.

Third, in the early a.m. the stomach is empty and exercise does not complicate digestion as it would from exercise later in the day.

Fourth, in the summer, morning workouts are coolest, more comfortable and less taxing to the body than workouts during the heat of the day. (During the winter, indoor exercising with the use of the indoor runner's treadmill prevents cancellations of the routine due to extra cold mornings.)

I personally find the early a.m. workout the most peaceful and enjoyable experience of the day. I get up at 4:20 a.m. and jog for an hour from 4:30 to 5:30 a.m. This really puts me on top of the day, clears my head, keeps me mellowed out and in balance all day. I find I'm much more alert and aware of life; I'm able to experience it to the fullest and enjoy it more. My appetite is better, and at the end of the day I rest better. But if I feel sleepy during the day, I take a short nap, especially if I went to bed late the night before. This eliminates another common excuse for postponements and cancellations.

Once you overcome the obstacle of getting up an hour early, you too will find the early a.m. is not only the most enjoyable time of the day to work out, but the most ideal, all things considered. It's the only time of day when no one can disturb or interrupt you: They are still in bed. And once you have established this "sacred" time of day, you have taken the first big step toward consistency in your Exercise Reform.

The Exercise Routine

Once our time of day is settled, we must then focus on the next of the keys—the routine itself—what kind of exercises we'll be doing. We are looking for a few good exercises for our ideal routine. Our most important consideration here is to select exercises we find enjoyable to do. They must, however, be exercises that will provide us with a good upper and lower body workout. The routine must be both simple and effective, and it must not be too time consuming. If we hate our exercises, we will soon dread and hate our routine as well. A troublesome conflict will then arise, and, instead of looking forward to our workout, we begin finding more and more excuses for postponement and cancellations. This is an unnecessary conflict and burden on our lives. It is the most common cause for failure in Exercise Reform because it undermines our motivation. It robs us of the joy of exercising and all the little rewards our daily exercise programs brings to our lives.

We know we must exercise our bodies for good health. It is up to us, then, to devise an exercise routine that keeps us exercising consistently—not for the need of it, but for the enjoyment of it. That's why I have adopted a routine I find thoroughly enjoyable.

My principle exercise is the jog. It is the most complete and enjoyable exercise we can do. It requires only a few supplementary exercises to give us the balanced, ideal routine we are looking for. In addition to my daily jogging routine, I add four sets of fifty pushups for my major upper body supplementary exercise. I do a set of these every quarter hour during the jog. After the hour jog is over, I add the supplementary exercise routine consisting of four torso-limbering exercises: Toe-toucher, Windmill, Sidebender and Trunktwister. I do only one set of each of these exercises and only twenty repetitions per set. This takes about five minutes and my routine is done. The important thing here is that the workout is over at the time I'd normally be getting out of bed. After a shower and perhaps a fruit breakfast to complete the a.m. preliminaries, I look forward to the day with great expectations, unbelievable energy and a positive attitude that makes life a real joy to live.

An hour's jogging, of course, is a goal to work up to. It should be done gradually, depending on age and physical condition. This goes for choosing the exercises and number of repetitions as well. The main

thing is to choose supplementary exercises that work the upper body to supplement the jog if it is being used as the principle lower body exercise in the program. These exercises must be simple, effective, not too time consuming and, most of all, they must be enjoyable to do. The routine then becomes enjoyable, something we look forward to each day. In this way we take the second big step in solving the motivation problem in our Exercise Reform.

Making The Exercise Program a Way Of Life

Once we have decided when we're going to exercise and what exercises we're going to do, getting the program built into our system is relatively simple. All that is required is that we become loyal to our newfound routine for a few months. The principle of "building it in" is to make the exercise program a way of life, an integral part of our life activities. We want the workout to become a necessary bodily function like eating, sleeping, defecating and urinating. These bodily functions are so much a part of our life activities that we do them each day and scarcely notice. That's the way it must be with our exercise routine. We must do this routine each day if we expect it to become a vital bodily function.

Some people advocate alternating exercises or even the routine itself every other day. I disagree. The key to consistency is building the routine into the system. This can only be achieved by doing the routine, like all other bodily functions, *every day.*

Trying to become consistent with our Exercise Reform should be looked upon as a project, an exercise in goal-setting and self-discipline. That is the way I approached it. The first year while I was still designing my program, I allowed myself one miss per week. At first it was hard to maintain this level of performance. Gradually, however, my body became accustomed to the exercise and my mind to the routine. The workouts became easier and easier to do because the workout had become built into my system. The second year I allowed myself only one miss per month. This was easy. The routine by then had become effortless, very enjoyable and rewarding. The third year I missed only three days. I was so much into the routine by then that I wouldn't have missed a workout for anything. It just never occurred to me to miss. Last year, the fourth and final year of the study, was a complete success—not a single miss—complete mastery over the motivation problem. I was indeed staying in shape for life and was enjoying every minute of it.

Such excellent progress can also be yours once you've completed the third big step in your Exercise Reform—once your workout has become like a bodily function, completely built into our system.

The three steps you have just taken in your mind can be taken just as easily in reality. You too can achieve success in your desire to become involved in your own Exercise Reform. It doesn't matter that your daily schedule is crowded. It doesn't matter if you're not an athlete or in good physical shape.

Even if you must work out alone—you can succeed. In designing your own exercise program, all you need do is focus on these three steps: (1) Choose a time of day when you cannot be interrupted by anyone or anything, and think seriously about the early a.m. hours for your workout. (2) Choose exercises for your routine that are simple, effective and not too time consuming. But most of all choose exercises you like and will enjoy doing every day. (3) You must do your routine faithfully every day until it becomes built into your system like a vital bodily function.

Following these steps should produce the desired results—the ideal exercise program you have been looking for, the program that helps you overcome the motivation problem and keeps you exercising consistently, not for the need of it, but for the sheer enjoyment of exercise. In this way you too will have no trouble "staying in shape for life."

Exercise: A Hygienic Perspective By Ralph C. Cinque, D.C.

That daily exercise is essential to develop and maintain good health is one Hygienic principle upon which there seems to be universal agreement. Even the medical profession encourages regular exercise as a means of prolonging youthfulness and promoting cardiovascular well-being. The overall merits of regular exercise are fully recognized, and we have no need here to further expound upon them.

However, there exists a great deal of confusion regarding the relationship between exercise and health. Many people equate health with physical conditioning. The classical American model of male health is represented by a robust well-muscled physique, with erect posture, great strength and power. Without necessarily deriding this ideal, I must insist that it is not synonymous with health. There is not always a direct proportion between the level of physical conditioning and the level of overall health. Physical conditioning is only one aspect of health. The best athlete is not necessarily the most healthy. The one who runs ten miles is not necessarily in better health than the one who runs only five, or one, or for that matter, none at all.

I once overheard a well-developed body builder relate to his companion that he was subject to occasional episodes of gout. Every few weeks one or the other leg and foot would swell up and produce agonizing pain. He would be crippled for days at a time and would have to resort to large doses of aspirin and other pain-killers in order to obtain relief. This incident made a tremendous impact on me because this particular body builder had an absolutely splendid physique. His muscular development, his posture, his body weight, his carriage, his symmetry, and his proportions were virtually ideal. He had the physique of a Greek god. By all popular notions, he was a picture of health. Yet, it should be obvious to the readers of this article that his health was far from perfect. Gout does not develop without causes, and being well-muscled does not lessen its implications or severity. How ironic that in the process of building an admirable outward condition, he built a morbid internal condition. It is likely that his interest in body building prompted him to follow a high-protein diet and to use protein supplements, liver extracts, etc., and that these practices were mostly responsible for the development of gout.

Although it is true that those who engage in regular physical activity achieve greater longevity than those who are largely sedentary, it has not been shown that superb athletes achieve greater longevity than those of moderate ability. With the exception of cardiovascular diseases, the incidence of degenerative diseases among athletes (such as cancer and arthritis) is approximately the same as for non-athletes. Lou Gehrig died of amyotrophic lateral sclerosis. Babe Ruth died of cancer. There have been many outstanding athletes who have died tragically of crippling diseases.

Acute diseases are equally as common among athletes. Many an athletic contest has been postponed due to colds and flus. Tennis star Jimmy Connors was recuperating from a month-long bout of mononucleosis right before one of the Wimbledon tournaments, and some have suggested that this was a factor in his loss to Borg.

Despite strong evidence to the contrary, the popular notion today is that exercise will insure us against disease. We are told that as long as you run everyday, you can eat all the fatty meats you want and not develop arteriosclerosis, for the running will keep down blood cholesterol and prevent arterial plaquing. We are told that playing tennis regularly will enable the body to "burn up" the caffeine and other toxic alkaloids of coffee and cola drinks, so drink all you want. Regular exercise will keep down blood pressure, so why cut out salt? Exercise diligently, perhaps excessively, and ignore every other aspect of Hygiene. That is the advice we receive from many of the "experts."

As Hygienists, we must stress the fact that exercise does not insure against disease and it does not remedy disease. All it can possibly do is supply the body's need for activity. If the individual who exercises but ignores proper diet fares better than the one who neither exercises or eats correctly, we can

account for this by recognizing that the latter ignored two life essentials while the former ignored only one. Exercise does not undo the effects of dietary abuses, but a lack of exercise may compound the effects of dietary abuses.

The body has physiological needs that can only be met through vigorous physical activity. The development of muscular strength and endurance, a powerful heart, great respiratory capacity, vibrant circulation, thorough lymphatic drainage and superb neuromuscular coordination all require the influence of regular exercise. However, from the standpoint of overall health, there is a limit to the amount of good that the body can derive from regular exercise. The body's actual physiological needs for exercise are not as great as some people believe. We do not have to become marathon runners in order to avoid cardiovascular disease. One can achieve high-level health without ever developing outstanding athletic capabilities. Of course we have no objection to vigorous physical training, and we recognize that it is the only way to enhance performance. Possessing great strength, speed and endurance is practical and desirable even if it doesn't guarantee great health or longevity.

Vigorous exercise entails a tremendous energy expenditure. This expenditure is compensated for in the physiological benefits that we derive from exercise. The amount of energy that we can safely expend in physical activity depends upon the level of our overall health and vitality. The invalid, who is in great need of rest, can only engage in brief and mild periods of exercise without enervation. The seasoned athlete, on the other hand, may be able to perform amazing feats of strength and endurance without dissipation. It is difficult to designate arbitrarily what constitutes excess in the realm of physical activity because individual factors are the most important considerations. What is excessive for one person may be unproductive for someone else.

The initial effect of exercise is to deplete the body of nerve force and tissue substance. The secondary and lasting effect, however, is to strengthen and build the body. This occurs while resting as the body prepares for future episodes of activity. Exercise must be vigorous in order to be effective. Slow walking, sauntering along on a bicycle, casually twirling the extremities—these activities are of little value. Subjecting the body to stress (within reasonable limits) is what exercise is all about. Exercise must be invigorating, strenous, challenging and taxing in order to occasion dynamic physiological changes. Only by placing great demands upon our bodies can we acquire great strength and stamina.

A short period of vigorous activity is more beneficial than a long period of mild activity. A short but hard run will build greater power than a long slow jog. It is also less depleting. Lifting a heavy weight a few times will build greater strength than lifting a light weight many times. A good exercise regime will provide for both endurance, the ability to sustain an activity over a long period and strength, the ability to overcome resistance in a single instance, as well as speed and agility. A well known jogging expert advised a woman recently to run slower in order to increase her jogging distance to ten miles. My advice would have been just the opposite, that is, to run a shorter distance harder, thereby deriving greater physiological benefits and less profound exhaustion.

Determining the best manner in which to train depends upon what one's objectives are. The person who is exercising for general health and fitness will have different goals than the one who is trying to achieve excellence in some particular sport. Obviously, one can only become a great long-distance runner if one habitually runs long distances. One can only become a great cyclist if one cycles regularly. Great swimmers become so only by putting in many hours in the pool. Developing outstanding capability requires participation far in excess of the body's physiological needs for activity. However, expenditures of this kind can be made without depleting the body as long as the individual gradually subjects his or her body to greater stress, and makes a point to secure enough rest and sleep to fully compensate for the added exertion. For example, one should not attempt to run long distances (30 to 40 miles per week) while going to school full time and working (as I once tried to do). It is possible to become progressively more enervated even as one's level of conditioning improves. However, for the individual with a less hectic schedule, who is able to rest 9 to 10 hours every day, such a running program may be entirely constructive.

Unfortunately, many runners do overexert themselves. The effects of excess vary from mild to severe strains and sprains. Pronounced physiological depression marked by weight loss, loss of libido, insomnia, amenorrhea 'in the female, and digestive disturbances have resulted from an overly strenuous training schedule. These problems are usually resolved easily by securing more rest and curtailing one's activity. In some instances, too rapid progression is found to the crux of the problem.

Which activities are best from a Hygienic standpoint? As always, we refer the argument back to Nature. Those activities that conform with physiological principles relating to joint motion and body mechanics are most desirable. Formal exercise is really just a substitute for natural activities that we would perform in a state of Nature. All natural activities require total body participation. When we run, jump, climb, swim, etc., our bodies are acting as a unit, even though certain muscle groups may be playing a predominant role. Such activities not only strengthen and condition us, they enhance body energy, coordination, balance and freedom. By entailing a fluidity of motion, these activities enable us to avoid excessive strain and tension. In contrast, activities that entail rigid postures, isolated muscular efforts, and limited ranges of motion, may have the opposite effect, that is, to increase tension and to stress the joints and muscles.

Perhaps running is the most natural human activity. Like deer, human beings are running animals. We are capable of running great distances smoothly, effortlessly and efficiently. Certainly we are not aquatic animals and bicycles never grew on trees. Team sports are popular because of cultural influences, not biological inclinations. Running is considered to be the most superb exercise for strengthening the heart, lungs and circulation. It is not necessary to run great distances in order to derive these physiological benefits. Running 2 to 3 miles every other day is fully adequate to achieve optimal cardiovascular conditioning. Those who wish to run greater distances can do so, but no one should feel compelled to run longer than this for health reasons. Running sprints, running up hills, running up stairs and other variations are likely to be of greater value than just jogging. Running alone is not adequate for good conditioning. Such activities as vigorous calistenics, weight training and gymnastics round out an exercise program that includes running. This is particularly important in regard to developing the upper torso and extremities, which are largely undeveloped by running.

When is the best time to exercise? Again, we must apply Hygienic reasoning. Eat when you are hungry. Drink when you are thirsty. Rest when you are tired. So it would follow that you should exercise when you feel vigorous. It is a mistake to use exercise as a stimulant, to perk ourselves up through exercise when our bodies are actually calling for rest and sleep. A feeling of relative vibrancy should precede and occasion our workouts and not vice versa. If we feel languid, we should rest until our energies have been recuperated to the point that we feel like becoming active. If you happen to feel all washed out on any given day, it would be unHygienic to force yourself to exercise in spite of it. Just as we can rouse up an appetite by eating, even in the absence of hunger, so too can we rouse up a feeling of invigoration by exercise, but the latter is just as artificial as in the former. Get in tune with your body and seek always to supply your body's needs as they fluctuate in the course of daily life. There is really no best time to exercise, just as there is no best time to eat. Some mornings I feel inclined o start running right out of bed, and I do so. Other mornings I feel no such inclination, so I postpone or cancel my usual run. Learn to live with a flexible schedule in regard to exercise, and for that matter, all aspects of Hygiene.

Can a person attain great athletic ability eating fruits, nuts and vegetables? The answer is a qualified yes. I was introduced to Hygiene by two brothers, both in their 30's, who had been Hygienists for many years and who were excellent runners of marathon caliber. Eating Hygienically lends itself to great athletic achievement, particularly in endurance activities. A high alkalinizing diet, composed largely of fresh fruits and vegetables, enhances one's oxidative powers and one's ability to sustain muscular effort. On the other hand, such a diet promotes rather slender body build. I have never met a raw fooder with a "Charles Atlas" physique and doubt that I ever will. For one thing, the diet is too low in protein. Secondly, raw vegetable foods do not stimulate anabolism the way cooked foods do. Yet, lean muscularity may be closer to the biological norm for physical development than the immense size that we generally associate with classical body building. It is unlikely that human beings in a state of Nature,

living on the spontaneous products of the trees in a gentle climate, would tend to massive physiques. Peoples throughout the world who are known for achieving great longevity tend, as a rule, to be rather slender. Keep in mind that I do not object to weight training or bodybuilding, but only to the excessive bulkiness that many weight lifters develop.

Many Hygienists are too thin and underdeveloped. In most cases, barring pathological causes, this is the result of an overly restrictive diet, both in regard to quantity and variety of food and to inadequate physical training. In all fairness, however, we must recognize that the paucity of outstanding athletes among Hygienists is due mostly to the paucity of Hygienists. Yet, Hygiene has not been without its talents. Among our practitioners, for example, Dr. Sidhwa is a first-rate long-distance runner. Dr. Burton is a prominent cyclist in Australia who competes regularly in grueling races. Dr. Benesh is a veteran physical culturist who, at the age of 67, engages in weight training, running and vigorous calisthenics. The last time I visited him, he said apologetically that he was running only six miles a day, but added quite candidly, "I try to take it at a fast clip." Dr. Shelton, himself, was an outstanding weight lifter and had a rugged build that matched his personality.

What role does exercise play in the recovery of health? I believe that it plays a greater role than some Hygienists think. Unfortunately, many Hygienists are preoccupied with food and fasting. To them, life is one great cleansing. They live from one fast to the next one. Or they consume themselves in concerns over food in between. Purification becomes their greatest goal in life, elimination the ultimate purpose in living. They fail to see fasting for what it is—a temporary expedient that enables us to secure a foundation from which to build ourselves. The only contests they wish to enter are fasting marathons. They never give their bodies a chance to enter a building phase. They deny themselves, by their imbalance, the opportunity to grow, to develop a physique, to acquire great strength, speed and endurance. Instead of practicing Hygiene so as to live, they live so as to practice Hygiene—a most unHygienic endeavor. It is no wonder that such individuals remain weak, puny and pedestrian in their lives.

Among feeble children, particularly, I have found exercise to be of greatest importance in building vigor and promoting growth and development. Those with weak digestion can derive much benefit from engaging in vigorous physical workouts. The role of exercise in promoting recovery in tuberculosis, and other respiratory problems, is well known. Exercise strengthens not only our muscles, but our entire organism, including our minds. It is possible that exercise has a more profound effect upon the organism than any other single Hygienic factor.